

AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Sensor Description

Manufacturer/Model:
Dylos/DC1100 PRO &
DC1700

Pollutants: PM Count

Measurement Range:
0 - 200000 #/L

Type: Optical



Additional Information

Field evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/field>

Lab evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/laboratory>

AQ-SPEC website:

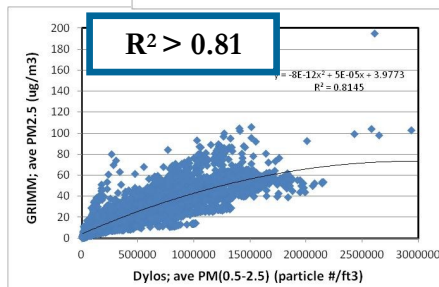
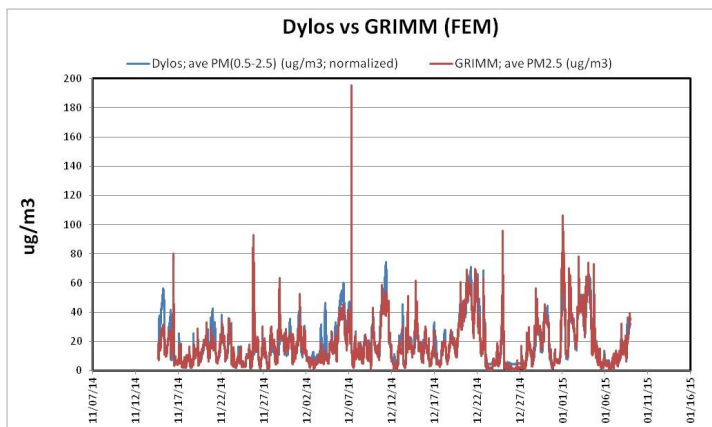
<http://www.aqmd.gov/aq-spec>

Evaluation Summary

- Dylos DC1100 PRO model was used in the field evaluation. DC1700 model was used in the laboratory evaluation. The main difference between the two models is the power supply: DC1100 PRO is powered by battery, whereas DC1700 runs both on battery and power cable.
- In the laboratory study, three DC1700 units showed low accuracy compared to GRIMM over the range of 0 – 200000 #/L.
- The three Dylos DC1700 sensors exhibited high precision for most tested environmental conditions, except at 5 °C and 65%.
- Both DC1700 and DC1100 PRO showed low intra-model variability as well as good data recovery.
- Dylos sensors had good correlation with the reference instrument from both field (DC1100 PRO; $R^2 > 0.81$) and laboratory studies (DC1700; $R^2 > 0.89$).

Field Evaluation Highlights

- Deployment period 11/14/2014- 01/09/2015: the three **Dylos DC1100 PRO** PM sensors correlated well the PM_{2.5} concentration change as monitored by FEM instrument. (Polynomial regression equation used to “convert” DC1100 PRO’s particle count measurements to PM mass concentrations. See DC1100 PRO Field Evaluation.)
- The units showed good data recovery as well as low intra-model variability.



Coefficient of Determination (R^2) quantifies how the three sensors followed the PM concentration change by GRIMM.

An R^2 approaching the value of 1 reflects a near perfect agreement, whereas a value of 0 indicates a complete lack of correlation.

Laboratory Evaluation Highlights

Accuracy $A (\%) = 100 - \frac{|\bar{X} - \bar{R}|}{\bar{R}} * 100$

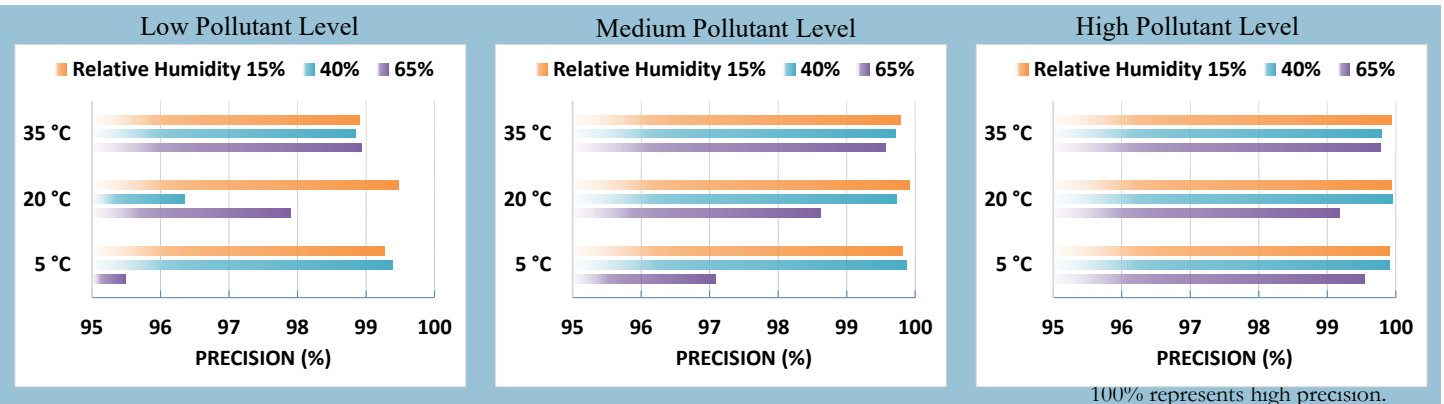
Steady State (#)	Sensor mean (#/L)	GRIMM (#/L)	Accuracy (%)
1	22223	4235	-4147
2	52460	14314	-2565
3	76464	26176	-1821
4	165596	136104	-117

Negative % means sensors' overestimation. The higher the positive value (close to 100%), the higher the sensor's accuracy.



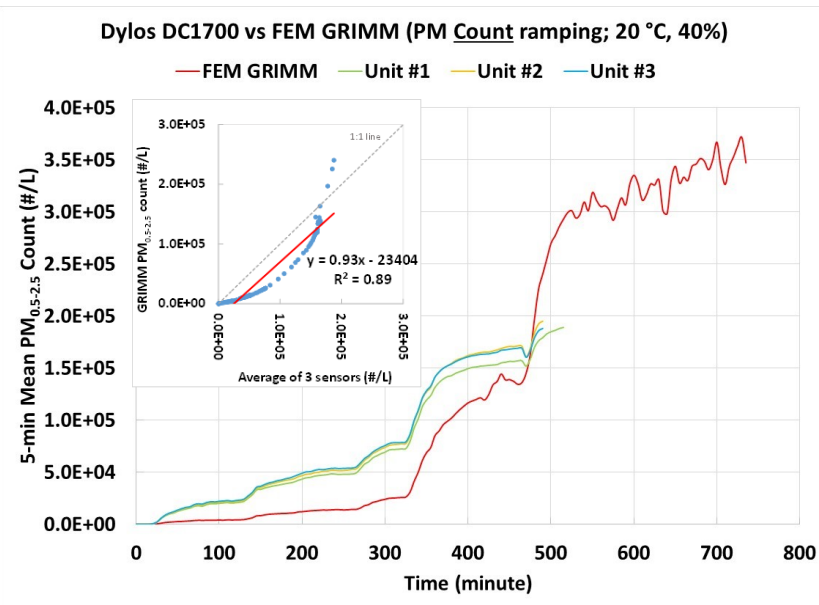
Accuracy was evaluated in a concentration ramping experiment at 20 °C and 40%. The sensor's readings at each ramping steady state were compared to the reference instrument.

Precision



Sensor's ability of generating precise measurements of PM concentration at low, medium, and high pollutant levels were evaluated under 9 combinations of T and RH, including extreme weather conditions like cold and humid (5 °C and 65%), hot and humid (35 °C and 65%), cold and dry (5 °C and 15%), and hot and dry (35 °C and 15%).

Coefficient of Determination



The three Dylos DC1700 sensors showed good correlation with the corresponding GRIMM PM_{0.5-2.5} count data ($R^2 = 0.89$) at 20 °C and 40% RH.

Climate Susceptibility

In most cases, temperature and relative humidity did not affect DC1700 units' precision. At 5 °C and 65% RH, Dylos DC1700 units reported spiked changes in PM_{0.5-2.5} count concentrations, resulting into the lowest precision observed.

Observed Interferents

Not tested for PM sensors



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